

Faculty of Engineering and Technology
Radha Govind University
Chandausi, Sambhal (U.P.)



Evaluation Scheme & Syllabus for
Department of CivilEngg.
DIPLOMA –CIVIL ENGINEERING
II Year(III & IV Semester)
(Effective from session _____)

DIPLOMA IN CIVIL ENGG. STUDY AND EVALUATION SCHEME

2nd Year, 3rd Semester

SUBJECT CODE	SUBJECT NAME	STUDY SCHEME Periods /Week			Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
DCE 301	CONSTRUCTION MATERIALS	2	-	2	3	30	-	30	70	-	70	100
DCE 302	BASIC SURVEYING	1	-	-	1	30	-	30	70	-	70	100
DCE 303	MECHANICS OF MATERIALS	2	-	-	2	30	-	30	70	-	70	100
DCE 304	BUILDING CONSTRUCTION	2	-	2	3	30	-	30	70	-	70	100
DCE 305	CONCRETE TECHNOLOGY	2	-	-	2	30	-	30	70	-	70	100
DCE 306	BASIC SURVEYING LAB	-	-	4	2	-	25	25	-	25	25	50
DCE 307	MECHANICS OF MATERIALS LAB	-	-	4	2	-	25	25	-	25	25	50
DCE 308	BUILDING PLANNING AND DRAWING LAB	1	-	4	3	-	25	25	-	25	25	50
DCE 309	CONCRETE TECHNOLOGY	-	-	4	2	-	25	25	-	25	25	50
Total					20	150	100	250	350	100	450	700

For pass the candidate is required to obtain 40% marks in each paper and 50% marks in aggregate.

DIPLOMA IN CIVIL ENGG. STUDY AND EVALUATION SCHEME

2nd Year, 4th Semester

SUBJEC CODE	SUBJECT SNAME	STUDY SCHEM E Periods /Wee k			Credits	MARKSINEVALUATION SCHEME						Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESMEN T			
		L	T	P		Th	Pr	Tot	Th	Pr	Tot	
DCE 401	HYDRAULICS	2	-	-	2	30	-	30	70	-	70	100
DCE 402	ADVANCE SURVEYING	2	-	-	2	30	-	30	70	-	70	100
DCE 403	THEORY OF STRUCTURE	2	-	1	3	30	-	30	70	-	70	100
DCE 404	DESIGN OF REINFORCED CEMENT CONCRETE STRUCRURES	2	1	-	3	30	-	30	70	-	70	100
DCE 405	WATER RESOURCE ENGINEERING	2	-	-	2	30	-	30	70	-	70	100
DCE 406	PUBLIC HEALTH ENGINEERING	1	-	2	2	30	-	30	70	-	70	100
DCE 407	HYDRAULICS LAB	-	-	2	1	-	25	25	-	25	25	50
DCE 408	ADVANCE SURVEYING LAB	-	-	4	2	-	25	25	-	25	25	50
DCE 409	REINFORCED CEMENT CONCRETE STRUCTURES DRAWING LAB	1	-	4	3	-	25	25	-	25	25	50
Total					20	180	75	255	420	75	495	750

For pass the candidate is required to obtain 40% marks in each paper and 50% marks in aggregate.

Industrial training (Summer Internship) of 4-6 weeks duration to be organized after 4th semester exam.

DCE 301 CONSTRUCTION MATERIALS

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2	-	2

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn about various construction materials, and understand their relevant characteristics.
- To be able to identify suitability of various materials for different construction purposes.
- To know about natural, artificial, and processed materials available for various purposes of construction activities.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Select suitable materials for construction activities and can have required technical knowledge on the same

CO2- Analyse the quality concern in the field of civil Engineering construction by adopting suitable standard on materials.

CO3- Handle the construction project as supervisor/site Engineer/project engineer by having Overall technical knowledge on materials.

CO4- Prepare detailed specifications about materials used in construction activities.

CO5- Do research and able to develop new, sustainable/improved material for the future Construction industry.

COURSE CONTENTS

Unit – I: Overview of Construction Materials (4 periods)

- Scope of construction materials in Building Construction, Transportation Engineering, Environmental Engineering, Irrigation Engineering (applications only).
- Selection of materials for different civil engineering structures on the basis of strength, durability, Eco friendly and economy.
- Broad classification of materials – Natural, Artificial, special, finishing and recycled.

Unit – II: Natural Construction Materials (6 periods)

- Requirements of good building stone; general characteristics of stone; quarrying and dressing methods and tools for stone.
- Classification of Rocks : Geological, Physical and chemical classification
- Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber, use of bamboo in construction.
- Asphalt, bitumen and tar used in construction, properties and uses.
- Types of Lime, Properties of lime and uses. Slacking of lime
- Properties of sand and uses
- Classification of aggregate according to size

Unit- III: Artificial Construction Materials (8 periods)

- Constituents of brick earth, Conventional / Traditional bricks, Modular and Standard bricks, Special bricks–fly ash bricks, Characteristics of good brick, Field tests on Bricks, Classification of burnt clay bricks and their suitability, Manufacturing process of burnt clay brick, fly ash bricks, Aerated concrete blocks(AAC).
- Flooring tiles – Types, uses
- Manufacturing process of Cement - dry and wet (only flow chart), types of cement and its uses. Field tests on cement.
- Pre-cast concrete blocks- hollow, solid, pavement blocks, and their uses.
- Plywood, particle board, Veneers, laminated board and their uses.
- Types of glass: soda lime glass, lead glass, borosilicate glass, Toughened glass, Reinforced glass, Fiber glass and their uses.
- Ferrous and non-ferrous metals and their uses.

Unit– IV: Special Construction Materials (4 periods)

- Types of material and suitability in construction works of following materials: Water proofing, Termite proofing; Thermal and sound insulating materials.
- Fibers and its Types –Jute, Glass, Plastic, Asbestos Fibers, (only uses).

Unit– V: Processed Construction Materials (6 periods)

- Constituents and uses of POP (Plaster of Paris), POP finishing boards, sizes and uses. Gypsum and Gypsum based material.
- Paints- whitewash, cement paint, Distempers, Oil Paints and Varnishes with their uses.(Situations where used).

- Industrial waste materials- Fly ash, Blast furnace slag, Granite and marble polishing waste and their uses.
- Agro waste materials - Rice husk, Bagasse, coir fibers and their uses.
- Special processed construction materials; Geo-synthetic, Ferro Crete, Artificial timber, artificial sand and their uses.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce.

List of Recommended Books/References

1. Ghose, D. N., Construction Materials, Tata McGraw Hill, New Delhi.
2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, Delhi
3. Varghese, P.C. , Building Materials, PHI learning, New Delhi.
4. Rangwala, S.C., Engineering Materials, Charator publisher, Ahemdabad.
5. Somayaji, Shan, Civil Engineering Materials, Pearson education, New Delhi.
6. Rajput, R.K, Engineering Materials, S. Chand and Co., New Delhi.
7. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, NewDelhi.

DCE 302 BASIC SURVEYING

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COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand types of surveying works required.
- To know the types of equipment and method to be used for different surveys.
- To know the use and operational details of various surveying equipment.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Introduction to Engineering Survey Understanding the basic terms & Principles of Surveys

CO2- Explain the principle of chain surveying and Perform the operations involved in Chaining.

CO3- Describe the operations involved in compass surveying like taking bearings and calculation of included angles and traversing.

CO4- Explain the fundamental principles of leveling, tabulate the leveling field data, explain the computation of reduced levels, different types of leveling, and contour surveying.

CO5- Use digital plan meter to calculate the areas.

COURSE CONTENTS

Unit – I Overview and Classification of Survey (2 periods)

- Survey- Purpose and Use.
- Types of surveying- Primary and Secondary, Classification: Plane, Geodetic, Cadastral, Hydro-graphic, Photogrammetric and Aerial.
- Principles of Surveying.
- Scales: Engineer's scale, Representative Fraction (RF) and diagonal scale.

Unit– II Chain Surveying (3 periods)

- Instruments used in chain survey: Types of Chains, Tapes, Arrow, Ranging rod, Line ranger, Off-set rod, Open cross staff, Optical square.
- Chain survey Station, Base line, Check line, Tie line, Offset, Tie station.
- Ranging: Direct and Indirect Ranging.
- Methods of Chaining, obstacles in chaining and Ranging

- Errors in length: Instrumental error, personal error, error due to natural cause, random error, Tape corrections.
- Principles of triangulation.
- Types of offsets: Perpendicular and Oblique.
- Conventional Signs, Recording of measurements in a field book.

Unit– III Compass Traverse Survey (3 periods)

- Compass Traversing- open, closed.
- Technical Terms: Geographic/ True Magnetic Meridians and Bearings, Whole Circle Bearing system and Reduced Bearing system and examples on conversion of given bearing to another bearing (from one form to another), Fore Bearing and Back Bearing, Calculation of internal and external angles from bearings at a station, Dip of Magnetic needle, Magnetic Declination.
- Components of Prismatic Compass and Surveyor compass and their Functions, Methods of using Prismatic Compass- Temporary adjustments and observing bearings.
- Local attraction, Methods of correction of observed bearings - Correction at station and correction to included angles.
- Methods of plotting a traverse and closing error, Graphical adjustment of closing error.

Unit– IV Levelling and Contouring (4 periods)

- Basic terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks- GTS, Permanent, Arbitrary and Temporary, Reduced Level, Rise, Fall, Line of collimation, Station, Back sight, Fore sight, Intermediate sight, Change point, Height of instruments.
- Types of levels: Dumpy, Tilting, Auto level, Digital level, Components of Dumpy Level and its fundamental axes, Temporary and permanent adjustments of Level.
- Types of Leveling Staff: Self-reading staff and Target staff.
- Reduction of level by Line of collimation and Rise and Fall Method.
- Leveling Types: Simple, Differential, Fly, Profile and Reciprocal Levelling.
- Curvature and refraction correction.
- Contour, contour intervals, horizontal equivalent.
- Uses of contour maps, Characteristics of contours, Methods of Contouring: Direct and indirect.

Unit– V Measurement of Area and Volume (2 periods)

- Components and use of Digital planimeter.
- Measurement of area using digital planimeter.
- Measurement of volume of reservoir and earthwork calculation from contour map.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests.
- Actual practical work, exercises and viva-voce.
- Presentation and viva-voce.

SUGGESTED LEARNING RESOURCES

1. Punmia, B.C.; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying I, Laxmi Publications, New Delhi.
2. Basak, N. N., Surveying and Leveling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling volume I, Pune Vidyarthi Gruh Prakashan.
4. Duggal, S. K., Survey I, McGraw Hill Education, New Delhi.
5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning New Delhi.

BASIC SURVEYING LAB

LIST OF PRACTICAL TO BE PERFORMED

1. Measure distance between two survey stations using chain, tape and ranging rods when two stations are inter visible.
2. Undertake reciprocal ranging and measure the distance between two stations.
3. Determine area of open field using chain and cross staff survey.
4. Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass.
5. Measure Fore Bearing and back bearing of a closed traverse of 5 or 6 sides and correct the bearings and included angles for the local attraction.
6. Undertake Survey Project with chain and compass for closed traverse for minimum 5 sides around a building and Plot the traverse on A1 size imperial drawing sheet for data collected in Survey Project mentioned in practical
7. Undertake simple leveling using dumpy level/ Auto level and leveling staff.
8. Undertake differential leveling and determine Reduced Levels by Height of instrument method and Rise and fall method using dumpy level/Auto Level and leveling staff and set up gradient.
9. Undertake fly leveling with double check using dumpy level/ Auto level and leveling staff.
10. Undertake Survey Project with Leveling instrument for Profile leveling and cross sectioning for a road/canal/Railways length of 500 m with cross-section at 30 m interval.
11. Plot the L-section with minimum 3 cross-sections on A1 size imperial sheet for data collected in Survey Project mentioned in practical.
12. Undertake Survey Project for plotting contour map using block contouring method for a block of 150m x 150m with grid of 10m x 10m.
13. Plot the contours on A1 size imperial drawing sheet for data collected in
14. Survey Project mentioned in practical.

DCE 303 MECHANICS OF MATERIAL

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn properties of area and structural material properties.
- To understand the concept of stress and strain.
- To calculate shear force, bending moment for different shapes of structural elements and corresponding stresses.
- To understand the concept of buckling loads for short and long columns.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Know stresses and strain and its application in Engineering field

CO2- Articulate practical applications of moment of inertia of symmetrical and unsymmetrical structural sections.

CO3- Analyze the determinate beams and draw the SFD and BMD.

CO4- Determine the bending and shear stresses in beams under different loading conditions.

CO5- Analyse the column for various loading and end conditions.

COURSE CONTENTS

Unit-I Simple Stresses and Strains (6 periods)

- Properties of Materials, Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials. Introduction to tensile test, compressive test, impact test, fatigue test, torsion test on metals.
- Concept of stress, normal and shear stresses, Concept of strain and deformation, longitudinal and transverse strain, poisson's ratio, volumetric strain, Hooke's law, moduli of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants.
- Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight, stress produced in compound and tapering bars due to axial load.
- Stress-strain diagram for mild steel and HYSD steel, proof stress, mechanical properties, factor of safety. Temperature stresses and strains

Unit-II Moment of Inertia

(6 periods)

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- Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle (without derivations).

- Second moment of area for L, T and I sections, section modulus.

Unit-III Shear Force and Bending Moment (6 periods)

- Concept of a beam and supports (Hinges, Roller and Fixed), types of beams: simply supported, cantilever, propped, over hang, fixed and continuous beams (only concept).

- Types of loads (dead load, live load, snow load, wind load seismic load as per IS Codes etc) and types of loading (point, uniformly distributed and uniformly varying loads)

- Concept of bending moment and shear force, sign conventions, Bending Moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to concentrated, uniformly distributed and varying loads

- Relationship between load, shear force and bending moment, point of maximum bending moment, and point of contraflexure.

- Fixed and continuous beams-simple numerical problems.

Unit-IV Bending and Shear Stresses in Beams (6 periods)

- Bending Stresses in Beams, Concept of pure/simple bending, Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only, Moment of resistance, Calculations of bending stresses

- Shear Stresses in Beams, Concept of shear stresses in beams, shear stress distribution in rectangular, circular I, T, L sections for beams

Unit-V Columns (4 periods)

- Theory of columns- long and short columns, slenderness ratio, Problem solving using Euler's and Rankine formula.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests.

- Actual practical work, exercises and viva-voce.

- Presentation and viva-voce.

Suggested learning resources:

1. Bedi D.S. , Strength of Materials, Khanna Publishing House, Delhi, Ed. 2018
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
7. Bansal R K, Strength of Materials, Laxmi Publications.
8. Subramaniam R, Strength of Materials, Oxford University Press.

MECHANICS OF MATERIAL LAB

LIST OF PRACTICALS TO BE PERFORMED:

1. Study and understand the use and components of Universal Testing Machine (UTM).
2. Perform Tension test on mild steel as per IS:432(1) and compute value of young's modulus.
3. Perform tension test on Tor steel as per IS:1608, IS:1139.
4. Conduct compression test on sample test piece using Compression Testing Machine.
5. Conduct Izod Impact test on three metals. e.g. mild steel/ brass/aluminum /copper /castiron etc as per IS:1598.
6. Conduct Charpy Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /castiron etc as per IS:1757.
7. Plot Shear force and Bending Moment diagrams for cantilever, simply supported beams.
8. Plot Shear force and Bending Moment diagrams for overhanging beams for different types of loads including moment loading.
9. Conduct Flexural test on timber beam on rectangular section in both orientation as per IS:1708, IS:2408.

DCE 304

BUILDING CONSTRUCTION

COURSE OBJECTIVES:

Following are the objectives of this course:

- To identify different components of building.
- To understand different types of foundation and their significance.
- To know different types of masonry and their construction.
- To highlight the importance of communications in building planning.

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COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Recommend suitable type of foundation and set out in the field and Identify components of building structures.

CO2- Identify suitable type of superstructure and recommend the appropriate construction techniques to be used.

CO3- Identifying doors, windows, ventilators types, applying suitable methods of waterproofing & Damp proofing.

CO4- Recommend suitable stair, flooring, & roof for different buildings

CO5- Apply selected paints on wall surface and apply anti-termite chemical on damaged timber

COURSE CONTENTS:

Unit – I: Overview of Building Components (4 periods)

- Classification of Buildings as per National Building Code Group A to I, As per Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure.
- Building Components - Functions of Building Components, Substructure– Foundation, Plinth.
- Superstructure – Walls, Partition wall, Cavity wall, Sill, Lintel, Doors and Windows, Floor, Mezzanine floor, Roof, Columns, Beams, Parapet.

Unit – II: Construction of Substructure (5 periods)

- Job Layout: Site Clearance, Layout for Load Bearing Structure and Framed Structure by Center Line and Face Line Method, Precautions.
- Earthwork: Excavation for Foundation, Timbering and Strutting, Earthwork for embankment, Material for plinth Filling, Tools and plants used for earthwork.
- Foundation: Functions of foundation, Types of foundation – Shallow Foundation, Stepped Footing, Wall Footing, Column Footing, Isolated and Combined Column Footing, Raft Foundation, Grillage Foundation. Deep Foundation - Pile Foundation, Well foundation and Caissons, Pumping Methods of Dewatering, Deep wells, Well points, Cofferdams (Introduction only).

Unit- III: Construction of Superstructure.

(6 periods)

- Stone Masonry: Terms used in stone masonry- facing, backing, hearting, Through stone, corner stone, cornice. Types of stone masonry: Rubble masonry, Ashlar Masonry and their types. Joints in stone masonry and their purpose. Selection of Stone Masonry, Precautions to be taken in Stone Masonry Construction.

- Brick masonry: Terms used in brick masonry- header, stretcher, closer, quoins, course,

face, back, hearting, bat bond, joints, lap, frog line, level and plumb. Bonds in brick masonry- header bond, stretcher bond, English bond and Flemish bond. Requirements of

good brick masonry. Junctions in brick masonry and their purpose and procedure. Precautions to be observed in Brick Masonry Construction. Comparison between stone and Brick

Masonry. Tools and plants required for construction of stone and brick masonry. Hollow concrete block masonry and composite masonry.

- Scaffolding and Shoring: Purpose, Types of Scaffolding, Process of Erection and Dismantling. Purpose and Types of Shoring, Underpinning. Formwork: Definition of Formwork, Requirements of Formwork, Materials used in Formwork, Types of Formwork for slabs, beams, columns, stripping time for removal of formwork as per IS 456

Unit- IV: Building Communication and Ventilation (7 periods)

- Horizontal Communication: Doors –Components of Doors, Full Paneled Doors, Partly Paneled and Glazed Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors. Sizes of Door recommended by BIS.

- Windows: Component of windows, Types of Windows - Full Paneled, Partly Paneled and Glazed, wooden, Steel, Aluminum windows, Sliding Windows, Louvered Window, Bay window, Corner window, clear-storey window, Gable and Dormer window, Skylight. Sizes of Windows recommended by BIS. Ventilators.

- Fixtures and fastenings for doors and windows- Material used and functions of Window Sill. and Lintels, Shed / Chajja.

Unit- V: Building Finishes

(6 periods)

- Floors and Roofs: Types of Floor Finishes and its suitability- Kota, Marble, Granite, Ceramic Tiles, Vitrified, Chequered Tiles, Paver Blocks, Concrete Floors, wooden Flooring, Skirting and Dado. Process of Laying and Construction, Finishing and Polishing of Floors, Roofing Materials- RCC, Mangalore Tiles, AC Sheets, G.I. sheets, Corrugated G.I. Sheets, Plastic and Fibre Sheets. Types of Roof: Flat roof, Pitched Roof-King Post truss, Queen Post Truss, terms used in roofs.

- Wall Finishes: Plastering – Necessity of Plastering, Procedure of Plastering, Single Coat Plaster, Double Coat Plaster, Rough finish, Neeru Finishing and Plaster of Paris (POP). Special Plasters- Stucco plaster, sponge finish, pebble finish. Plaster Board and Wall Claddings. Precautions to be taken in plastering, defects in plastering. Pointing – Necessity, Types of pointing and procedure of Pointing. Painting – Necessity, Surface Preparation for painting, Methods of Application.

SUGGESTED LEARNING RESOURCES:

1. S. P. Arora and Bindra., Building Construction, Dhanpat Rai Publication, Delhi.
2. Sushil Kumar., Building Construction, Standard Publication.
3. Rangawala, S. C., Building Construction, Charotar Publication, Anand.
4. Punmia B. C., and Jain A. K., Building Construction, Firewall Media.

5. Sharma S. K., Building Construction, S. Chand and Co. Pvt. Ltd., New Delhi.
6. Janardan Zha , Building Construction, Khanna Publication.
7. Bhavikatti S. S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.
8. Mantri S., A to Z Building Construction, Satya Prakashan, New Delhi.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

DCE 305

CONCRETE TECHNOLOGY

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COURSE OBJECTIVES

Following are the objectives of this course:

- To know properties of cement, aggregate and water used in concrete.
- To understand different characteristics of concrete.
- To learn about role of admixtures in concrete.

COURSE OUTCOMES (CO)

After completing this course, student will be able to:

CO1- Explain the properties of cement, types and grades.

CO2- Describe the grades of concrete and properties of fresh and hardened concrete.

CO3- Understand the concept of mix design and evaluate their strength..

CO4- Understand the manufacturing process of concrete, form work and quality control..

CO5- Apply relevant admixtures for concreting.

COURSE CONTENT

Unit – I Cement, Aggregates and Water (6 periods)

- Physical properties of OPC and PPC: fineness, standard consistency, setting time, soundness, compressive strength. Different grades of OPC and relevant BIS codes.
- Testing of cement: Laboratory tests-fineness, standard consistency, setting time, soundness, compressive strength. Storage of cement and effect of storage on properties of cement.
- BIS Specifications and field applications of different types of cements: Rapid hardening, Low heat, Portland pozzolana, Sulphate resisting, Blast furnace slag, High Alumina and White cement.
- Aggregates: Requirements of good aggregate, Classification according to size and shape.
- Fine aggregates: Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zone of sand, silt content and their specification as per IS 383. Concept of crushed Sand.
- Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specification.
- Water: Quality of water, impurities in mixing water and permissible limits for solids as per IS: 456-2000

Unit– II Concrete (6 periods)

- Concrete: Different grades of concrete, provisions of IS 456.
- Duff Abraham water cement (w/c) ratio law, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different exposure conditions as per IS 456.

- Properties of fresh concrete: Workability: Factors affecting workability of concrete. Determination of workability of concrete by slump cone, compaction factor, Vee-Bee Consistometer. Value of workability requirement for different types of concrete works. Segregation, bleeding and preventive measures.

- Properties of Hardened concrete: Strength, Durability, Impermeability

Unit– III Concrete Mix Design and Testing of Concrete (4 periods)

- Concrete mix design: Objectives, methods of mix design, study of mix design as per IS10262-2009 (only procedural steps).

- Testing of concrete, determination of compressive strength of concrete cubes at different ages, interpretation and co-relation of test results.

- Non- destructive testing of concrete: Rebound hammer test, working principle of rebound hammer and factor affecting the rebound index, Ultrasonic pulse velocity test as per IS13311 (part 1 and 2), Importance of NDT tests.

Unit– IV Quality Control of Concrete (6 periods)

- Concreting Operations: Storage, Batching, Mixing, Transportation, Placing, Compaction, Curing and Finishing of concrete.

- Joints in concrete construction: Types of joints, methods for joining old and new concrete, materials used for filling joints.

- Defects in Concrete: Identification of defects and methods of removing defects.

Unit– V Chemical Admixture, Special Concrete and Extreme Weather concreting (6 periods)

- Admixtures in concrete: Purpose, properties and application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixtures, air en- training admixtures and super plasticizers.

- Special Concrete: Properties, advantages and limitation of following types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete Self-compacting concrete and light weight concrete.

- Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weather condition.

- Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather condition.

- Under water concrete

SUGGESTED LEARNING RESOURCES:

1. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.

2. Shetty, M.S., Concrete Technology, S.Chand and Co.Pvt. Ltd., Ram Nagar, Delhi.

3. Santhakumar, A. R., Concrete Technology, Oxford University Press, New Delhi.

4. Neville, A. M. and Brooks, J.J., Concrete Technology, Pearson Education Pvt. Ltd.

5. Neville, A. M., Concrete Technology, Pearson Education Pvt. Ltd., New Delhi.

6. Sood, H., Kulkarni P. D., Mittal L. N., Laboratory Manual in Concrete Technology, CBS Publishers, New Delhi.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

CONCRETE TECHNOLOGY LAB

LIST OF PRACTICAL TO BE PERFORMED:

- 1 Determine fineness of cement by Blaine's air permeability apparatus or by sieving.
- 2 Determine specific gravity, standard consistency, initial and final setting times of cement.
- 3 Determine compressive strength of cement.
- 4 Determine silt content in sand.
- 5 Determine bulking of sand.
- 6 Determine bulk density of fine and coarse aggregates.
- 7 Determine water absorption of fine and coarse aggregates.
- 8 Determine Fineness modulus of fine aggregate by sieve analysis.
- 9 Determine impact value of aggregate.
- 10 Determine crushing value of aggregate.
- 11 Determine abrasion value of aggregate.
- 12 Determine elongation and flakiness index of coarse aggregates
- 13 Determine workability of concrete by slump cone test.
- 14 Determine workability of concrete by compaction factor test.
- 15 To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days.
- 16 Demonstration of NDT equipment's .

BUILDING PLANNING & DRAWING LAB

L	T	P
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COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn basic principles of building planning and drawing.
- To know graphical representation of various components of buildings.
- To draw complete plan and elevation of a building.
- To learn basics of perspective drawings and Computer Aided Drawings.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Interpret the symbols, signs and conventions from the given drawing.

CO2- Prepare line plans of residential and public buildings using principles of planning.

CO3- Prepare submission and working drawing for the given requirement of Load Bearing Structure.

CO4- Develop detailed drawing of various flooring patterns, specifically Diagonal bond and Herringbone bond, and justify their suitability for various building uses.

CO5- Draw two-point perspective drawing for given small objects.

COURSE CONTENTS

Unit – I Planning of Building

(4 periods)

- Conventions as per IS 962, symbols for different materials such as earthwork, brickwork, stonework, concrete, woodwork and glass.
- Graphical symbols for doors and windows, Abbreviations, symbols for sanitary and electrical installations.
- Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy.
- Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962.
- Rules and bye-laws of sanctioning authorities for construction work.
- Plot area, built up area, super built up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio).

Unit– II

(3 periods)

Drawing No. 1 : Details of spread footing foundations for a load bearing and non load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick apron have to be shown in the drawing.

Drawing No. 2 : Plans of ‘T’ and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond.

Drawing No. 3 : Drawing plan, elevation of arches: circular arch, segmental arch

Unit– III

(3 periods)

Drawing No. 4 : Elevation, sectional plan and sectional side elevation of flush door, fully glazed door, fully panelled door with wire gauge shutter, Partly paneled and partly glazed door.

Drawing No. 5 : Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation.

Drawing No. 6 : Drawing detailed working plan, elevation and section of a two rooms residential building from a given line plan or given data showing details of foundations, roof and parapet.

Unit– IV

(2 periods)

Drawing No. 7 : Drawings of following floors:

1. Cement concrete floors at ground level and at first floor level.
2. Brick floors:
 - a) Diagonal Bond
 - b) Herring Bone Bond
3. Bonded cement concrete flooring/ Marble flooring/ Terrazzo flooring
4. Ceramic/vitrified tile flooring

Drawing No. 8 : Drawing of flat roof, showing the heat/thermal insulation provisions.

Unit– V

(2 periods)

Drawing No. 9 : Drawing details of damp proofing arrangement of roofs and walls as per BIS Code. Show the rain water drainage arrangement also.

Drawing No 10: Drawing Damp Proofing details in basement of buildings.

DCH 401

HYDRAULICS

L	T	P
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COURSE OBJECTIVES:

Following are the objectives of this course:

- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn different types of pumps and their uses.

COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Define Parameters associated with fluid flow and hydrostatic pressure, types of flow, total energy and total head, Bernoulli's theorem. Determine the co-efficient of discharges of orifice meter, venturimeter.

CO2- Describe about the different types of Orifices and Mouthpieces and to derive discharge formulae and their practical applications and determine the co-efficient of discharges of Orifice, mouthpiece

CO3- Describe the losses of heads in pipes, major losses, minor losses, pipes in parallel flow / series flow connected to the reservoirs, determine the friction factor of the pipe.

CO4- Describe the different types of Notches, and derive the discharge formulas and their Practical applications and coefficient of discharges for different notches.

CO5- Classify various types of pumps, Describe the advantages, working principles, construction details, specifications and efficiencies of Reciprocating Pumps and Centrifugal Pumps and Draw the characteristic curves for centrifugal and Reciprocating pumps.

COURSE CONTENT

Unit – I Pressure measurement and Hydrostatic pressure (6 periods)

- Technical terms used in Hydraulics–fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics - ideal and real fluid, application of hydraulics.
- Physical properties of fluid – density-specific volume, specific gravity, surface tension, capillarity, viscosity-Newton's law of viscosity.
- Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Pascal's law of fluid pressure and its uses.
- Measurement of differential Pressure by different methods.
- Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls.
- Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical and inclined surface in contact with liquid on either side

Unit– II Fluid Flow Parameters (4 periods)

- Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Nonuniform, Steady, Unsteady flow. Stream line, stream tube, streak line, path line Reynolds number.
- Discharge and its unit, continuity equation of flow.
- Energy of flowing liquid: potential, kinetic and pressure energy.
- Bernoulli's theorem : statement, assumptions, equation. (Without proof of theorem)

Unit– III Flow through pipes

(8 periods)

- Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, Use of Moody's Diagram and Nomograms.
- Critical velocity and velocity distribution in a pipe for laminar flow
- Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement And fittings.
- Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe. Hydraulic gradient line and total energy line.
- Water hammer in pipes: Causes and Remedial measures.
- Discharge measuring device for pipe flow: Venturimeter - construction and working.
- Discharge measurement using Orifice, Hydraulic Coefficients of Orifice.

Unit– IV Flow through Open Channel

(5 periods)

- Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section.
- Determination of discharge by Chezy's equation and Manning's equation
- Conditions for most economical rectangular and trapezoidal channel section.
- Discharge measuring devices: Triangular and rectangular Notches.
- Velocity measurement devices: current meter, floats and Pitot tube.
- Specific energy diagram, Froude's' Number, Hydraulic jump.

Unit– V Hydraulic Pumps

(5 periods)

- Concept of pump, Types of pump - centrifugal, reciprocating, submersible.
- Centrifugal pump: components and working
- Reciprocating pump: single acting and double acting, components and working.
- Suction head, delivery head, static head, Manometric head
- Power of centrifugal pump.
- Selection and choice of pump.
- Introduction of Impulse and Reaction turbine.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce.

SUGGESTED LEARNING RESOURCES:

1. Modi, P. N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat RaiPublishing, New Company Delhi.
4. Khurmi R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

HYDRAULICS LAB

LIST OF PRACTICALS TO BE PERFORMED:

- 1 Use piezo meter to measure pressure at a given point.
- 2 Use U-tube differential manometer to measure pressure difference between two given points.
- 3 Use Reynold's apparatus to determine type of flow.
- 4 Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.
- 5 Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement.
- 6 Calibrate Venturimeter to find out the discharge in a pipe.
- 7 Calibrate the Orifice to find out the discharge through a tank
- 8 Use Current meter to measure the velocity of flow of water in open channel.
- 9 Use Pitot tube to measure the velocity of flow of water in open channel.
- 10 Use Rectangular and triangular notch to measure the discharge through open channel.

DCE 402

ADVANCE SURVEYING

COURSE OBJECTIVES

Following are the objectives of this course:

- To know methods of plane surveying and Theodolite surveying and their uses
- To learn tachometric surveying and curve setting
- To understand the principles of Electronic Distance Measurement equipment and Total station and their use.
- To know the concept of remote sensing, GPS and GIS

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COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Prepare plans using Plane Table Surveys.

CO2- Apply the knowledge of principles and purpose of theodolite surveying and trigonometrical levelling.

CO3- Apply the knowledge of principles and purpose of tachometric surveying and areas and volumes.

CO4- Know the principles and purpose of Total Station and GPS.

CO5- To understand the Knowledge of Remote Sensing

COURSE CONTENT

Unit – I Plane Table Surveying (4 periods)

- Principles of plane table survey.
- Accessories of plane table and their use, Telescopic alidade.
- Setting of plane table; Orientation of plane table - Back sighting and Magnetic meridian method, True Meridian Method.
- Methods of plane table surveys- Radiation, Intersection, Traversing and resection (Two point and Three point methods).
- Merits and demerits of plane table survey.

Unit– II Theodolite Surveying (6 periods)

- Types and uses of Theodolite, Components of transit Theodolite and their functions, Reading the Vernier of transit Theodolite.
- Technical terms- Swinging, Transiting, Face left, Face right.
- Fundamental axes of transit Theodolite and their relationship
- Temporary adjustment of transit Theodolite.
- Measurement of horizontal angle- Direct and Repetition method and reiteration methods.
- Measurement of magnetic bearing of a line, Prolonging and ranging a line, deflection angle.

- Measurement of vertical Angle.
- Theodolite traversing by Included angle method and Deflection angle method.
- Checks for open and closed traverse, Calculations of bearing from angles.
- Traverse computation- Latitude, Departure, Consecutive coordinates, Independent coordinates, balancing the traverse by Bowditch's rule and Transit rule, Gale's Traverse table computation.
- Errors and Precautions in theodolite surveying.

Unit– III Tacheometric surveying and Curve setting (6 periods)

- Principles of Tacheometry, Tacheometer and its component parts, Anallactic lens.
- Tacheometric formula for horizontal distance with telescope horizontal and staff vertical.
- Field method for determining constants of tacheometer, Determining horizontal and vertical distances with tacheometer by fixed hair method and staff held vertical, Limitations of tacheometry.
- Simple circular curve: Basic definitions, Designation of curves, Types of curves used in roads and railway alignments.
- Transition curves: Definition and requirement.
- Setting simple circular curve by offsets from long chord, Tangent and Rankine's method of deflection angles.
- Introduction of vertical circular curve.

Unit– IV Advanced surveying equipments (6 periods)

- Principle of Electronic Distance Meter (EDM), its component parts and their Functions, use of EDM.
- Use of micro optic Theodolite and Electronic Digital Theodolite.
- Use of Total Station, Use of function keys.
- Measurements of Horizontal angles, vertical angles, distances and coordinates using Total Station, Traversing, Profile Survey and Contouring with Total Station.

Unit– V Remote sensing, GPS and GIS (6 periods)

- Remote Sensing – Overview, Remote sensing system, Applications of remote sensing in Civil engineering, land use / Land cover, mapping, disaster management.
- Use of Global Positioning System (G.P.S.) instruments.
- Geographic Information System (GIS): Overview, Components, Applications, Software for GIS.
- Introduction to Drone Surveying.

SUGGESTED LEARNING RESOURCES:

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh Prakashan, Pune.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd., Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.

4. Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., NewDelhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punmia, B.C.; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
8. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, McGraw Hill Education, Noida.
10. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

ADVANCE SURVEYING LAB

LIST OF PRACTICALS TO BE PERFORMED

1. Use plane table survey to prepare plans of a plot of seven sided closed traverse by Radiation Method.
2. Use plane table survey to prepare plans, locate details by Intersection Method and resection method. (Two point problem & three point problem)
3. Use plane table survey to prepare plans, locate details by Traversing Method.
4. Use plane table survey to carry out Survey Project for closed traverse for minimum five sides around a building.
5. Use transit theodolite to measure Horizontal and Vertical angle by Direct Method.
6. Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Theodolite Survey Project.
- 7 Set out a circular curve by Rankine's Method of Deflection Angles.
8. Use EDM to measure horizontal distance.
9. Use Total station instrument to measure horizontal distances.

10. Use Total station instrument to measure vertical angle.
11. Use Total station instrument to carry out Survey Project for closed traverse for minimum five sides.
12. Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Total Station Survey Project.
13. Use GPS to locate the coordinates of a station.

DCE- 403

THEORY OF STRUCTURE

COURSE OBJECTIVES

Following are the objectives of this course:

- To learn concept of eccentric loading and stresses in vertical members like column, chimneys, dam
- To analyze beams using various methods like slope deflection, three moment, and moment distribution
- To understand different methods of finding axial forces in trusses.

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COURSE OUTCOME:

After completing this course, student will be able to:

CO1- Analyze stresses induced in vertical member subjected to direct and bending loads.

CO2- Analyze slope and Deflection in fixed and continuous beams.

CO3- Analyze continuous beam under different loading conditions using the principles of Three Moments.

CO4- Analyze continuous beam using Moment Distribution Method under different loading conditions.

CO5- Evaluate axial forces in the members of simple truss.

COURSE CONTENT

Unit – I Principal stress and strain

(6 periods)

- Stress on inclined planes, principal plane and principal stress in elements subjected to direct and shear stress and their combinations. Mohr Circle for calculation of stress on inclined planes and principal strain for above cases.

Unit – II Combined Direct and Bending stress

(6 periods)

- Eccentric loading middle third rule columns subjected to uni-axial and bi-axial eccentric loading. Dams- application of middle third rule for finding the base width calculation of stresses at the base of dam and stability of dam against overturning and sliding vertical structures like chimney subjected to movement due to wind forces.

Unit- III Strain Energy

(6 periods)

- Strain energy stored in a member due to axial loading and bending. Strain energy stored by a beam due to uniform bending moment. Work done by a force on a member law of reciprocal deflection, Betti's law. The first theorem of Castigliano. Deflection of truss joints.

Unit– IV Moment distribution method and Slope Deflection Method

(5 periods)

- Moment distribution method: Basic proposition relative stiffness, continuous beams with and without fixed ends. Sinking of support portal frames with and without sway (simple problem only)
- Slope Deflection Method : Basic concepts, stiffness of members with far end fixed or hinged. Development of slope deflection equations and their application to beams and frames.

Unit– V Simple trusses

(5 periods)

- Types of trusses (Simple, Fink, compound fink, French truss, pratt truss, Howetruss, North-light truss, King post and Queen post truss)
- Calculate support reactions for trusses subjected to point loads at joints
- Calculate forces in members of truss using Method of joints and Method of sections.

SUGGESTED LEARNING RESOURCES:

1. Ramamrutham.S, Theory of structures, Dhanpatrai& Sons.
2. Khurmi, R. S. , Theory of Structures S. Chand and Co., New Delhi.
3. Bhavikatti, S S , Structural Analysis Vol-1, ,Vikas Publishing House Pvt Ltd.NewDelhi.
4. Junnarkar, S. B. , Mechanics of structures, Volume-I and II Charotar PublishingHouse, Anand.
5. Pandit, G.S. and Gupta, S.P., Theory of Structures, Tata McGraw Hill, New Delhi.
6. Agor R, Structural Analysis, Khanna Publishing House, Delhi.

INSTRUCTIONAL STRATEGY

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MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

DCE- 404 DESIGN OF REINFORCED CEMENT CONCRETE STRUCTURES

L	T	P
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COURSE OBJECTIVES

Following are the objectives of this course:

- To learn the concept of limit state design for tension and compression steel members.
- To learn the concept of limit state design of steel beams.
- To understand design of RCC elements.
- To know the design of short and long RCC columns.

COURSE OUTCOMES:

After completing this course, student will be able to perform:

CO1- Demonstrate the basic concepts of reinforced cement concrete and the design of beams for flexure..

CO2- Apply Limit State Method concepts for flexural design using safety factors, design loads, and stress block parameters.

CO3- Describe the design of rectangular beams for shear and designing of T and L beams.

CO4- Design the one-way and two way slabs.

CO5- Explain the design of columns and column footings.

COURSE CONTENT

Unit – I Introduction (8 periods)

Concept of Reinforced Cement Concrete (RCC)

Reinforcement Materials: - Suitability of steel as reinforcing material

- Properties of mild steel, HYSD steel and TMT bars

Loading on structures as per IS: 875

Introduction to following methods of RCC design : Working stress method: Definition

and basic assumptions Limit state method: Definition and basic assumptions

Working stress method: Shear and Development length Problems of singly, doubly and T beam analysis by Working stress method

Shear as per IS: 456-2000 by working stress method

i) Shear strength of concrete without shear reinforcement

ii) Maximum shear stress

iii) Shear reinforcement

iv) Development Length

Unit– II Concept of Limit State Method (8 periods)

Concept of Limit State Method:

- Definitions and assumptions made in limit state of collapse (flexure)

- Partial factor of safety for materials
- Partial factor of safety for loads
- Design loads
- Stress block, parameters

Unit– III Design of Reinforced Concrete Beams by Limit State Method (9 periods)

Singly Reinforced beam : Theory and design of singly reinforced beam by Limit State Method

Doubly Reinforced Beams : Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method Behavior of T beam, inverted T beam, isolated T beam and 'L' beams. Simple problems related to moment capacity.

Unit– IV Design of One way and Two way slab (9 periods)

One Way Slab: Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method.

Two Way Slab : Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State Method including sketches showing reinforcement details (plan and two sections).

Unit– V Design of axially loaded RCC Column and Pre-stressed Concrete (9 periods)

- Axially Loaded Column:
- Definition and classification of columns
- Effective length of column,
- Specifications for longitudinal and lateral reinforcement
- Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement (sectional elevation and plan)
- Pre-stressed Concrete:
- Concept of pre-stressed concrete
- Methods of pre-stressing: pre-tensioning and post-tensioning
- Advantages and disadvantages of pre-stressing
- Losses in pre-stress

SUGGESTED LEARNING RESOURCES:

- Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune, 2014.
- Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
- Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
- Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
- Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other studentcentered activities in class room and actively participate in listening exercises.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce.

DCE 405
WATER RESOURCE ENGINEERING

L	T	P
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COURSE OBJECTIVES

Following are the objectives of this course:

- To learn estimation of hydrological parameters.
- To understand water demand of crops and provisions to meet the same.
- To know planning of reservoirs and dams.
- To design irrigation projects, canals and other diversion works.

COURSE OUTCOMES

After completing this course, student will be able to:

CO1- Describe the different methods to increase the yield of Crops, various methods of irrigation and their suitability..

CO2- Explain the concept of Hydrology, measurement of rain gauge , ground water resources and measurement of yield of well,

CO3- Explain the soil-water plant relationship, water requirements of crops and cropping pattern in India..

CO4- Describe about the construction and maintenance work of canal and canal linings, canal head works and cross regulators.

CO5- Design the different hydraulic structures like dams, spillways, weir and Barrages and the concepts of maintenance shall also form part.

COURSE CONTENT

Unit – I Introduction to Hydrology (5 periods)

Hydrological Cycle : Rainfall, definition rain-gauges – automatic and nonautomatic, methods of estimating average rainfall, Advantages of keeping rainfall records, (Arithmetic system); catchment area, runoff, factors affecting runoff, hydrograph, basic concept of unit hydrograph.

Unit– II Crop water requirement (6 periods)

- Principal crops in India and their water requirements, Crop seasons – Kharif and Rabi
- Soil water, soil crop and crop water relationships, Duty, Delta and Base Period, their relationship, Gross commanded area (GCA), culturable commanded area (CCA), Intensity of Irrigation, Paleo irrigation, Kor, Crop Ratio, Crop period, Base period, Duty, Delta. Relation between Duty-Delta and Base period.
- Definition of water logging – its causes and ill effects, detection, prevention and remedies, Surface and sub-surface drains and their layout.

Unit– III Methods of Irrigation (5 periods)

- Definition of irrigation, Necessity of irrigation, Role of Irrigation in country's economy. History of development of irrigation in India, Major, medium and minor irrigation projects of India.
- Flow irrigation - its advantages and limitations, Lift Irrigation – Tubewell, submersible and well irrigation advantages and disadvantages, Sprinkler irrigation conditions favorable and essential

requirements for sprinkler irrigation, sprinklersystem – classification and component parts, Drip irrigation, suitability of drip irrigation, layout, component parts, advantages

- Tubewell Irrigation comparison with canal irrigation, Tubewells, explanation of terms: water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers. Types of tubewells (cavity type, strainer type and slotted type) and their choice
- Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance, Water Harvesting Techniques: Need and requirement of various methods, Run-off from roof top and ground surface, construction of recharge pits and recharge wells and their maintenance.

Unit– IV Diversion Head Works & Canals (6 periods)

- Canals: Factors to be considered in Canal Alignment. Functions/Purpose of various components of Canal. Classification of Canals and their functions, sketches of different canal cross-sections, Various types of canal lining - their related advantages and disadvantages, sketches of different lined canal X-sections, Breaches – Causes, Method to plug canal breaches and their control, Maintenance of lined and unlined canals.
- Canal Head Works and Regulatory Works : Choice of location of Canal Head Works, definition, object, general layout, functions of different parts of head works. Difference between weir and barrage Cross Drainage Works : Functions and necessity Cross Drainage Works, Types of Cross Drainage Works: aqueduct, superpassage, level crossing, inlet and outlet, Sketches of the above cross drainage works. Introduction of Kennedy and Lacey theory.
- Cross Drainage Works : Functions and necessity Cross Drainage Works, types of Cross Drainage Works: aqueduct, super passage, level crossing, inlet and outlet, Sketches of the above cross drainage works.

Unit– V Dams and Spillways and river training works (6 periods)

- Dams : Classification of dams; earthen dams - types, causes of failure; cross-section of homogeneous, zoned and diaphragm type earthen dams, method of construction. Gravity dams – types, cross-sections of a dam, method of construction, Concept of small and micro dams, Concept of spillways and energy dissipators.
- River Training Works : Various River Stages, Purpose/functions of River Training works, Meandering of rivers, Methods of river training, guide banks, Marginal Embankment, retired (levees) embankments, groynes and spurs, pitched island, cutoff.

SUGGESTED LEARNING RESOURCES:

1. Punmia, B.C., Pande, B, Lal, Irrigation and Water Power Engineering, Laxmi Publications
2. Subramanian, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education
6. Asawa, G.L., Irrigation and water resource Engineering, New Age
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic Structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

DCE 406 PUBLIC HEALTH ENGINEERING

COURSE OBJECTIVES:

Following are the objectives of this course:

- To learn the principles for identification of sources of surface and subsurface water
- To learn calculation of population and requirement of drinking water
- To understand the plotting of water supply scheme highlighting different features
- To know evaluation of characteristics and treatment of sewage.

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COURSE OUTCOMES:

After completing this course, student will be able to:

CO1- Describe the process in water supply scheme, types of pipes, pipe joints, laying & testing of pipes for the conveyance of water supply, physical, chemical & biological test on the water samples, standards of drinking water

CO2- Analyze the process of primary, secondary & tertiary treatment of water and their transmission along with disinfection, softening of water.

CO3- Plan and design the water distribution networks, Layouts of different Distribution networks suitable for appropriate location, Systems of Water Supply.

CO4- Plan and design the sewerage systems, Characterization of Sewage, select the appropriate appurtenances in the sewerage systems.

CO5- Describe the process of Primary Treatment of Sewage such as Screening, Grit Chamber, Skimming Tank, Sedimentation, and Coagulation of Sewage.

COURSE CONTENT

UNIT – I Sources, Demand and Quality of water

(3 periods)

Water supply schemes - Objectives, components,

- Sources of water: Surface and Subsurface sources of water, Intake Structures, Definition and types, Factors governing the location of an intake structure, Types of intakes.
- Demand of water: Factors affecting rate of demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimating of quantity of water supply required for city or town.
- Quality of water: Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli, B coli index, MPN, Sampling of water, Water quality standards as per IS 10500.

UNIT - II Purification of water

(3 periods)

- Purification of Water: Objectives of water treatment, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Clariflocculator.
- Filtration - mechanism of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter. Construction and working of slow sand filter and rapid sand filter, operational problems in

filtration. Disinfection: Objects, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Flow diagram of water treatment plants.

- Miscellaneous water Treatments: Introduction to water softening, Dechlorination and Defluoridation techniques.

UNIT III Conveyance and Distribution of water

(2 periods)

- Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline and other related appurtenances.
- Distribution of water: Methods of distribution of water- Gravity, pumping, and combined system, Service reservoirs - functions and types, Layouts of distribution of Water-Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.
- Laying of pipe, testing of pipe lines, Building water supply (Practical aspect only).

UNIT IV Domestic sewage and Sewerage System

(3 periods)

- Introduction: Purpose of sanitation, Necessity of systematic collection and disposal of waste, Definition of terms in sanitary engineering, Collection and conveyance of sewage, Conservancy and water carriage systems, their advantages and Disadvantages (a) Surface drains (only sketches) : various types, suitability (b) Types of sewage: Domestic, industrial, storm water and its seasonal variation.
- Sewerage System : Types of sewerage systems, materials for sewers, their sizes and joints Appurtenance: Location, function and construction features. Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts.
- Laying and Construction of Sewers : Setting out/alignment of sewers, Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes. Construction of surface drains and different sections required.

UNIT V Characteristics and treatment of Sewage

(3 periods)

- Sewage Characteristics : Properties of sewage and IS standards for analysis of sewage, Physical, chemical and bacteriological parameters
- Natural Methods of Sewerage Disposal: General composition of sewage and disposal methods, Disposal by dilution, Self purification of stream, Disposal by land treatment, Nuisance due to disposal
- Sewage Treatment : Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams, Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plain sedimentation tanks, primary clarifiers, secondary clarifiers, filters, control beds, intermittent sand filters, trickling filters, sludge treatment and disposal, oxidation ponds (Visit to a sewage treatment plant) Oxidation ditch, duckweed pond, Vermiculture
- Building Drainage : Aims of building drainage and its requirements, Different sanitary fittings and installations, Traps
- Introduction to smart water supply and waste water management : A field visit may be planned to explain and show the relevant things.

SUGGESTED LEARNING RESOURCES

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers

3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

REINFORCED CEMENT CONCRETE STRUCTURES DRAWING

LAB

LIST OF PRACTICAL TO BE PERFORMED:

RC Drawing:

1. Reinforcement details from the given data for the following structural elements with bar bending schedules
2. General instruction and rules, Drawing 1- lap, joint, development drawing: length rings, hook etc.
3. Drawing No. 2: RC Slabs - One way slab, Two way slab and Cantilever Slab.
4. Drawing No.3: Beams - Singly and doubly reinforced rectangular beams and Cantilever beam (All beams with vertical stirrups), T Beam, Tapered Beam.
5. Drawing No.4: Columns and Footings – Square, Rectangular and Circular Columns with lateral ties and their isolated sloped column footings, column and beam junction
6. Drawing No. 5: Portal Frame – Three bay two storey RC portal frame with blowup of column beam junctions.
7. Drawing of cantilever retaining wall showing details of all the members and reinforcement.
8. Drawing of Intze type water tank showing details of all the members and reinforcement.